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Expedited procedure  
Examining Group 2813

AUG 01 2005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Cyril Cabral, Jr. et al. Examiner: Erik J. Kielin  
Serial No: 10/827,064 Art Unit: 2813  
Filed: April 19, 2004 Docket: YOR91990509US3 (13171AB)  
For: METHOD AND STRUCTURE Dated: July 8, 2005  
FOR REDUCTION OF CONTACT  
RESISTANCE OF METAL SILICIDES  
USING A METAL-GERMANIUM ALLOY

Confirmation No. 2363

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P.O. Box 1450  
Alexandria, VA 22313-1450

RESPONSE UNDER 37 C.F.R. § 1.116

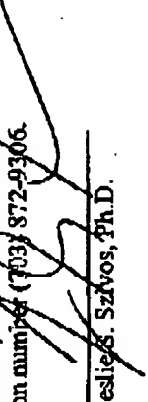
Sir:

In response to the final Office Action dated May 19, 2005, Applicants hereby submit the following amendments and remarks for entry of record in the above-identified patent application.

CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that this document is being filed in the United States Patent and Trademark Office on the date shown below via facsimile transmission to Mail Stop AF, Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450 at United States Patent and Trademark Office facsimile transmission number (703) 872-9306.

Dated: July 8, 2005

  
Leslie S. Szvos, Ph.D.

**SECTION I. (AMENDMENTS TO THE CLAIMS)**

A listing of claims 1-32 of the present application, with markings showing amendments made herein, is provided below:

Claims 1-23 (Cancelled)

Claim 24 (Currently amended) An electrical contact to a region of a silicon-containing substrate comprising a substrate having an exposed region of a silicon-containing semiconductor material; and a first layer of Ni monosilicide, wherein said substrate and said first layer are separated by a Si-Ge interlayer and said first layer of Ni monosilicide comprises 0.91 to 50 atomic percent of at least one alloy additive selected from the group consisting of C, Al, Si, Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb and Lu.

Claim 25 (Previously presented) The electrical contact of Claim 24 wherein said silicon-containing semiconductor material comprises single crystal Si, polycrystalline Si, SiGe, amorphous Si or a silicon-on-insulator (SOI).

Claims 26-27 (Cancelled)

Claim 28 (Previously presented) The electrical contact of Claim 24 wherein said substrate is doped.

Claim 29 (Previously presented) The electrical contact of Claim 24 wherein said substrate includes a p<sup>+</sup> silicon area.

Claim 30 (Currently amended) The electrical contact of Claim 24 wherein said substrate includes an n<sup>+</sup> silicon area.

Claim 31 (Currently amended) The electrical contact of Claim 24 wherein said at least one alloy additive is C, Al, Si, Sc, Ti, V, Cr, Mn, Fe, Co, Cu, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir or Pt.

Claim 32 (Currently amended) The electrical contact of Claim 31 wherein said at least one additive is Si, Ti, V, Cr, Nb, Rh, Ta, Re or Ir.

REMARKSResponse to Written Description Rejections

In response to the Examiner's rejections of claims 24, 25, and 28-32 under 35 USC §112, first paragraph, for lack of written description in the May 19, 2005 Office action, Applicants have hereby amended claim 24, from which claims 25 and 28-32 depend, to recite:

"24. An electrical contact to a region of a silicon-containing substrate comprising a substrate having an exposed region of a silicon-containing semiconductor material; and a first layer of Ni monosilicide, wherein said substrate and said first layer are separated by a Si-Ge interlayer and said first layer of Ni monosilicide comprises at least one additive selected from the group consisting of C, Al, Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu."

The instant specification describes use of metal germanium alloys as starting materials for fabricating metal silicide contacts (see the paragraph between pages 2 and 3 of the instant specification). More specifically, the instant specification states that "[w]hen Ni is employed as the metal [in the metal germanium alloy layer], Ni monosilicide is formed after a single annealing step" (see page 4, lines 19-20) and that "[t]he metal germanium alloy layer of the present invention may also include at least one additive... selected from the group consisting of C, Al, ..., Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu" (see page 9, lines 7-12).

It is clear that a Ni monosilicide layer formed by annealing a nickel germanium alloy layer that contains one or more additives listed hereinabove also contains such one or more additives.

Therefore, the instant specification provides sufficient description for a Ni monosilicide layer that comprises at least one additive selected from the group consisting of C, Al, Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce,

Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Y and Lu, as recited by claims 24, 25, and 28-32 of the present application.

**Response to the §103 Rejections of Claims 24, 25, and 28-32**

In the May 19, 2005 Office Action, the Examiner finalized previous rejections of claims 24, 25, and 28-32 under 35 USC §103(a) as being allegedly obvious over Legoues et al. U.S. Patent No. 5,810,924 (hereinafter "Legoues") or Yoshimi et al. U.S. Patent No. 5,698,969 (hereinafter "Yoshimi"), in view of Besser et al. U.S. Patent No. 6,165,903 (hereinafter "Besser").

Applicants respectfully traverse the Examiner's rejections of such claims, for the following reasons:

Claim 24, from which claims 25 and 28-32 depend, has been amended to positively recite:

"24. An electrical contact to a region of a silicon-containing substrate comprising a substrate having an exposed region of a silicon-containing semiconductor material; and a first layer of Ni monosilicide, wherein said substrate and said first layer are separated by a Si-Ge interlayer and said first layer of Ni monosilicide comprises at least one additive selected from the group consisting of C, Al, Si, Ti, V, Cr, Mn, Fe, Co, Ni, Zn, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu."

Note that in the amended claim 24, Si has been removed from the list of claimed additives. Correspondingly, claims 31 and 32, which depend from claim 24, have been amended herein to remove Si as one of the claimed additives.

In the May 19, 2005 Office Action, the Examiner expressly conceded that neither of the two primary references Legoues and Yoshimi teaches or suggests a Ni monosilicide layer, but attempted to remedy such a deficiency of the primary references by citing the secondary reference Besser, which discloses a NiSi layer.

However, nothing in Besser teaches or suggests a NiSi layer with an additive selected from the group consisting of C, Al, Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb and Lu.

Therefore, the hypothetical combination of Legoues, Yoshimi and Besser, as suggested by the Examiner in the May 19, 2005 Office Action, still fails to provide any basis for a Ni monosilicide layer containing at least one additive selected from the group consisting of C, Al, Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb and Lu, as positively recited by claims 24, 25, and 28-32 of the present application.

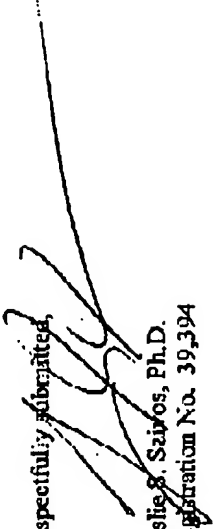
Thus, claims 24, 25, and 28-32 as amended herein are patentably distinguished over the cited references, and Applicants hereby request the Examiner to reconsider, and upon reconsideration to withdraw, the rejections of claims 24, 25, and 28-32.

#### CONCLUSION

Based on the foregoing, claims 24, 25, and 28-32, as amended herein and now pending in the application, are in firm and condition for allowance. Issue of a Notice of Allowance for the application is therefore requested.

If any issues remain outstanding, incident to the formal allowance of the application, the Examiner is requested to contact the undersigned attorney at (516) 742-4343 to discuss same, in order that this application may be allowed and passed to issue at an early date.

Respectfully submitted,

  
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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

# REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Address to:  
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P.O. Box 1460  
Alexandria, VA 22313-1460

Application Number: 10827064  
Filing Date: April 19, 2004  
Filer: Vened Inventor  
Attorney: Cyril Cabral, Jr.  
A1 Unit: 2813  
Examiner Name: Erik J. Kellin  
Attorney Docket Number: YOR91990591US3 (13171AB)

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application. Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or patent application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs to be submitted to the USPTO on page 2.

## 1. Submission required under 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered and amendments enclosed with this RCE will be entered in the order in which they were filed unless a different instruction is otherwise. If applicant does not wish to have any previously filed unentered amendments entered, applicant must request non-entry of such amendments.

a. ☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on

i. ☒ Other

The amendments and arguments in the July 8, 2005 Response.

b. ☐ Enclosed

i. ☐ Amendment to Reply

iii. ☐ Information Disclosure Statement (IDS)

ii. ☐ Affidavit/Declaration(s)

iv. ☐ Other

## 2. Miscellaneous

a. ☐ Suspension of action or the above-identified application is requested under 37 CFR 1.103(c) for

a period of \_\_\_\_\_ months. (Period of suspension shall not exceed 3 months. Fee under 37 CFR 1.17(f) required)

b. ☐ Other

3. ☒ Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

a. ☒ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments to Deposit Account No. 58-051078MVI. I have enclosed a duplicate copy of this sheet.

i. ☒ RCE fee required under 37 CFR 1.17(e)

ii. ☐ Extension of time fee 37 CFR 1.108 and 1.17

iii. ☐ Other

b. ☐ Check in the amount of \$ \_\_\_\_\_ enclosed

c. ☐ Payment by credit card (Form PTO-2336 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2336.

## SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature

Date August 1, 2005

Name (Print/Type)

Leah R. Brown, Ph.D.

Date

Registration No. 39,394

## CERTIFICATE OF MAILING OR TRANSMISSION

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This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to be (and by the USPTO is) processed, an application, Confidentiality is governed by 35 USC 122 and 37 CFR 1.11 and 1.14. This collection is necessary to the USPTO in order to process the application, including gathering, preparing, and submitting the completed application form to the USPTO. There will be no charge for this information. Any comments on the amount of time you require to complete this form and the burden on your business should be submitted to the Office of Management and Enterprise Services, U.S. Department of Commerce, Washington, D.C. 20513-1460. DO NOT SEND FEES OR COMPLETED FORMS TO THE INFORMATION OFFICE.



## CERTIFICATE OF TRANSMISSION BY FACSIMILE (37 CFR 1.8)

Applicant(s): Cyril Cabral, Jr., et al.

YOR91990600US3 (3171AB)

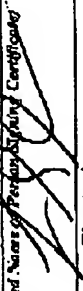
Application No. 10,827,064	Filing Date April 19, 2004	Examiner Erk J. Kiellin	Group Art Unit 2813
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Invention: METHOD AND STRUCTURE FOR REDUCTION OF CONTACT RESISTANCE  
OF METAL SILICIDES USING A METAL-GERMANIUM ALLOY

I hereby certify that this \_\_\_\_\_ Request for Continued Examination Transmitted  
(Identify type of correspondence)

is being facsimile transmitted to the United States Patent and Trademark Office (Fax No. 703-872-9306)

on \_\_\_\_\_  
August 1, 2005  
(Date)

Leslie S. Saffers, Ph.D.  
(Typed or Printed Name of Person Signing Certificate)  
  
(Signature)

Note: Each paper must have its own certificate of mailing.